

## Changes in the Biological Control Agent Complex of Yellow Starthistle over Eight Years

D. M. Woods, M. J. Pitcairn, D. B. Joley, and V. Popescu

A complex of five exotic insect species, all attacking the flowerheads, have been established in California for biological control of yellow starthistle (YST). Preliminary indications are that no single species will be the dramatic silver bullet in reducing YST abundance. Since all species are being distributed throughout the distribution of YST, we anticipate that changes in the species compositional makeup will occur over time and hope that the eventual mix will be effective on starthistle. We have been monitoring several sites in California repeatedly for seven to nine years for effects on YST density and the bioagent composition. This report describes a preliminary comparison of bioagent composition at five of these sites. Each site received some but not all species of insects, but all eventually supported some level of all insects as they immigrated from nearby locations. Entire plant samples were collected at the end of the season (September through October) and processed in the laboratory where each seedhead was examined for evidence of insect attack. Approximately 400 seedheads were evaluated per site per year. Four species, *Bangasternus orientalis* (Capiomont) (Coleoptera: Curculionidae), *Urophora sirunaseva* (Hering) (Diptera: Tephritidae), *Eustenopus villosus* (Boheman) (Coleoptera: Curculionidae), and *Chaetorellia succinea* (Costa) (Diptera: Tephritidae) are the primary focus in this report. The fifth agent, *Larinus curtus* Hochhut (Coleoptera: Curculionidae) is at such low levels as to be virtually undetectable.

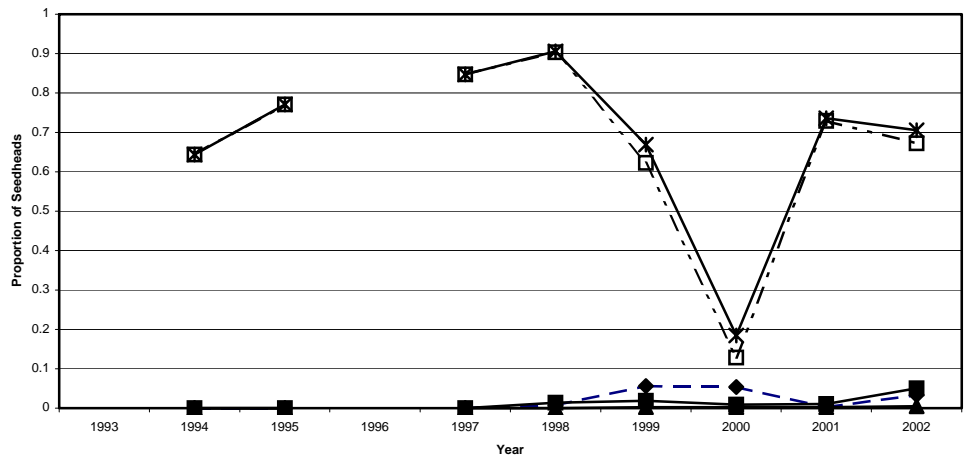
The Napa County site was one of the first in the nation for release of the hairy weevil, *E. villosus*. Weevils were released in 1991 and 1993. No other species of insect was intentionally released at this location. Three years after its release, the hairy weevil was attacking over 60 percent of the seedheads. Although all three of the other species of insect have successfully migrated to the area, they have not been able to establish substantial populations, attacking well below one percent of the total seedheads. A similar result occurred at the Nevada County site, which received a release of the hairy weevil in 1990. The hairy weevil attained and retains a dominating position today. Again, no other species was intentionally released at this location, but extensive intentional releases were made in the area. Interestingly, only the accidentally released *Chaetorellia succinea* has established more than a marginal presence.

The Placer County site is unusual in that all of the insect species had migrated to the site and established before we could release them. We made additional releases of *E. villosus*, *U. sirunaseva*, and *B. orientalis* in 1994 and 1995. However, *E. villosus* maintained an unassailable dominance of the seedheads at this site over the remainder of our monitoring.

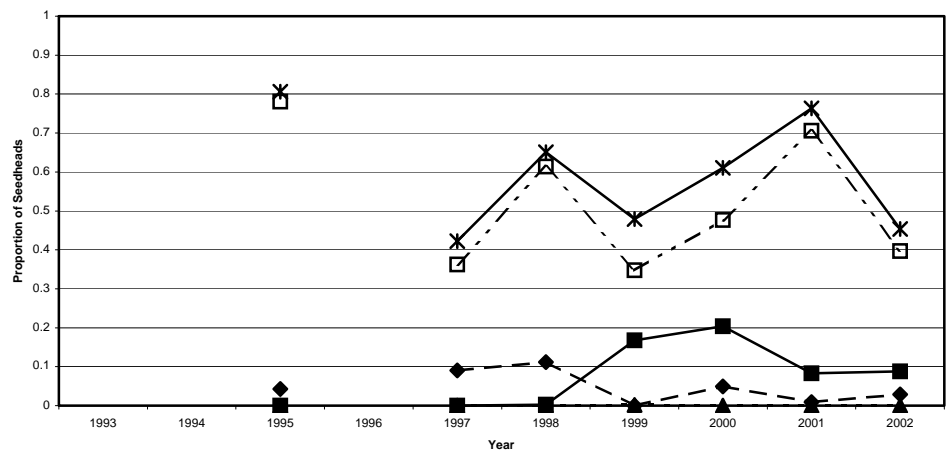
The Sonoma and Yolo County sites were essentially free of biological controls when monitoring first began. All agents except *C. succinea* were released in 1994 and 1995. *Chaetorellia* was released in 1995 at the Yolo County site, but naturally migrated to the Sonoma County site by 1997. The gallfly was able to establish a significant presence initially at both sites but seems to be gradually being displaced by the other biological control agents. The peacock fly seems to be able to make substantial inroads when *E. villosus* is at low levels (Yolo County site) and also slow but distinct inroads when *E. villosus* is at high levels (Sonoma County site).



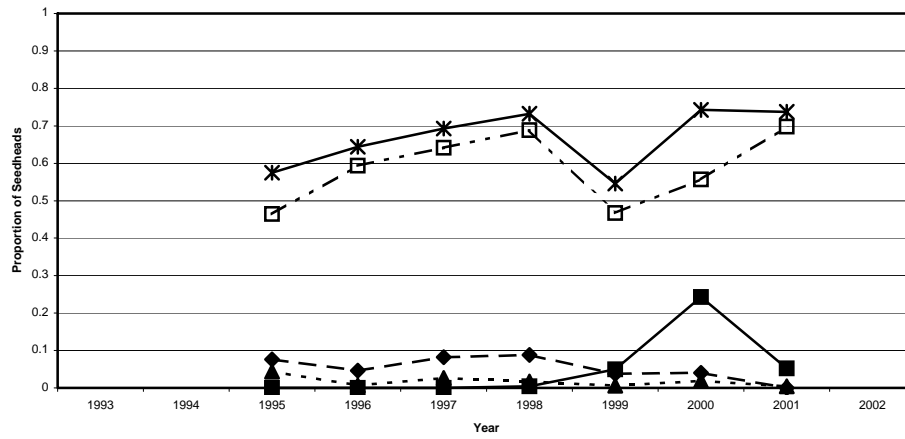
### Napa County Site



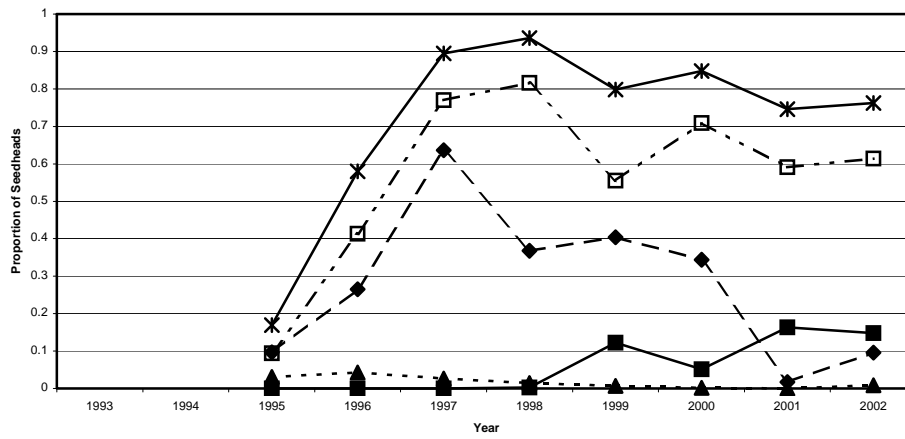
### Nevada County Site



Placer County Site



Sonoma County Site



Yolo County Site

